

University of Groningen

## Return to work and quality of life in severely injured patients

Post, R. B.; Van der Sluis, C. K.; Ten Duis, H. J.

*Published in:*  
Disability and Rehabilitation

*DOI:*  
[10.1080/09638280600641392](https://doi.org/10.1080/09638280600641392)

**IMPORTANT NOTE:** You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2006

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Post, R. B., Van der Sluis, C. K., & Ten Duis, H. J. (2006). Return to work and quality of life in severely injured patients. *Disability and Rehabilitation*, 28(22), 1399-1404.  
<https://doi.org/10.1080/09638280600641392>

**Copyright**

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

**Take-down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

*Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.*

## RESEARCH PAPER

# Return to work and quality of life in severely injured patients

R. B. POST<sup>1</sup>, C. K. VAN DER SLUIS<sup>1</sup> & H. J. TEN DUIS<sup>2</sup>

<sup>1</sup>Centre for Rehabilitation and Northern Centre for Health Care Research, and <sup>2</sup>Department of Surgery (section Traumatology), University Medical Centre Groningen, University of Groningen, The Netherlands

Accepted February 2006

### Abstract

**Background.** Little is known about the long-term consequences of severe injuries in terms of return to productivity and quality of life.

**Methods.** In this study we focused on the return to work status and quality of life in 53 severely injured patients (AIS/ISS  $\geq 16$ , mean ISS 24, range 16–54), mean age 37 years, one to two years after the injury. Questions were asked concerning employment in the past and at present. Quality of life was measured by means of the Sickness Impact Profile (SIP) questionnaire. Injury-related parameters were analysed in order to study their relation with disablement.

**Results.** Of those patients who survived their injuries, 87% had resumed their former work. Only 10% of the patients received disability benefits. A mean SIP-total score of 6.7 was found, the mean SIP-physical score was 5.9 and the mean SIP-psychosocial score was 6.9. “No disability” (SIP score  $\leq 3$ ) was found in 55% of the patients, whereas 11% of the patients reported “severe disability” (SIP score  $\geq 20$ ). Age was a significant predictor of disablement (odds ratio 1.07). The Injury Severity Score (ISS), the length of hospital stay and the number of diagnoses did not predict disablement.

**Conclusions.** Although the results were obtained in a relatively small sample size, the return to work rate in the surviving severely injured patients appears to be excellent. The quality of life is good; the majority of patients are not disabled. Age (and not the ISS) seems to be a significant predictor of disablement.

**Keywords:** Severe injury, trauma, return to work, quality of life, Sickness Impact Profile

### Introduction

Historically, the evaluation of trauma-outcome has mainly focused on mortality. For every injury fatality, however, 100 people have some degree of functional loss [1]. In addition, due to advancing treatment strategies and improving knowledge on trauma care, the mortality rates decrease, leaving more surviving patients. Therefore, the attention of medical professional workers should be focused on the functional outcome of trauma patients. Outcome can be expressed in physical, psychological or in social terms. In the last decades, the concept of quality of life has gained more attention as a possible way to determine the outcome of trauma patients. An important component of quality of life is the work status of the patients. Is return to their former work possible, do patients need adjustment at their workplace or do these patients rely on worker's

compensation? Furthermore, tools to predict disablement from injury-related parameters are needed.

The objective of this study is to reveal the work status and the quality of life of a cohort of severely injured patients one to two years after injury, as well as to analyse injury-related variables in relation to functional outcome.

### Methods

#### Patients

All severely injured patients of 18–65 years old (at the time of examination) treated during a one-year period at the Department of Traumatology of the University Medical Centre Groningen (UMCG) were included in the study. Patients were identified by using the local computerized registration system. If these data were incomplete, medical records were

used to consummate the data set. According to the literature, patients with an Injury Severity Score (ISS) higher than or equal to 16 were considered to be severely injured [2–5]. The ISS was computed from the Abbreviated Injury Scale (AIS), 1990 revision. The AIS categorizes each injury by body area (head/neck, face, thorax, abdomen, extremities, external). The severity of injury is graded from 0 (no injury) to 6 (not currently treatable) [6]. Coding of the severity of the injuries was initially done with the aid of a computer programme which converts ICD-9CM coded injury diagnoses into AIS and ISS [7]. These scores were checked by two of the three authors (CKvdS and HJtD) by using medical charts. The ISS is calculated by adding the squares of the highest AIS value in each of the three most severely injured body areas. The maximum ISS of 75 represents situations nearly incompatible with life [8]. Patients who were not capable of the Dutch language and those who suffered from a psychiatric illness were excluded.

### Questionnaires

In order to determine the work status of the patients, a postal questionnaire was sent containing questions concerning the patient's former and present work status. To receive information on the patients' quality of life the Dutch version of the Sickness Impact Profile (SIP) was applied [9].

The Sickness Impact Profile has been used in different (trauma) populations and is a reliable and valid instrument to measure the quality of life [9–13]. The instrument is composed of 136 statements describing health-related dysfunctional behaviors. The statements are grouped into 12 categories (ambulation, mobility, body care and movement, social interaction, alertness behavior, emotional behavior, communication, sleep and rest, eating, work, home management, recreation). A score can be computed for the overall instrument (SIP-total) and for two subscales that characterize physical (SIP-physical) and psychosocial dysfunction (SIP-psychosocial) [10,14]. SIP scores from 0–3 are considered to reflect no disability, scores from 4–9 reveal mild disablement and scores from 10–19 illustrate moderate disability; severe disablement is reflected by SIP scores from 20–100 [12].

### Statistical analysis

Statistical analysis was performed using SPSS 10.0 (SPSS Chicago, IL, USA). Categorical data were analysed by applying chi-square tests. In case of continuous data Student's *t*-tests were used. In order to analyse the influence of injury-related parameters on the outcome, binary logistic regression analysis

was performed using age, ISS, length of hospital stay and number of diagnoses as independent variables, and the dichotomized SIP scores ("disabled" [SIP scores 4–100] vs. "not disabled" [SIP scores 0–3]) as the dependent variable. A *p*-value of 0.05 was considered to be of statistical significant difference.

## Results

### Study population

During a one-year period, 89 patients with an ISS equal to or higher than 16, aged 18–65 years, were treated at the Department of Traumatology. Of those, 12 died during treatment (mortality rate = 13.5%). Three patients were not capable of the Dutch language, one patient had died due to another traffic accident and three subjects were lost to follow-up. The remaining 70 patients received a questionnaire. Fifty-three patients returned the questionnaire (response rate 53/70 = 76%, follow-up rate 53/77 = 69%).

The study group (*n* = 53) consisted of 43 males and 10 females. Their mean age was 37.3 years. The mean ISS was 23.5 and the mean length of hospital stay was 25 days. The mean follow-up time was 1.8 years, the mean number of diagnoses per patient was 5.0 (Table I).

Patients were divided by ISS score in a group of severely injured patients (ISS 16–24 [*n* = 36, mean ISS 19.1, median 18.0, SD 2.4]) and a group of very severely injured patients (ISS ≥ 25 [*n* = 17, mean ISS 33.0, median 29.0, SD 8.1]) [4].

The Maximum region AIS (MrAIS) corresponds to the part of the body where the most severe injury is found. In 20 patients, the MrAIS was found in the head/neck area, in 15 patients it was found in the thorax region and in 12 patients the MrAIS reflected the extremities. Seventeen patients had sustained severe head injuries (AIS scores 4–5). Thirty-nine patients had mild to moderate injuries of the extremities (AIS scores 1–3) (Table II).

Etiological factors were traffic accidents (*n* = 32), industrial accidents (*n* = 10) and private, sports or violence-related injuries (*n* = 11). Respondents did not differ from non-respondents in gender, age, ISS, length of hospital stay, follow-up time, etiological factors, AIS-scores or number of diagnoses.

Table I. Demographics of the study group (*n* = 53).

	Mean	Median	SD	Range
Age (years)	37.3	34.0	13.2	19–64
ISS	23.5	21.0	8.2	16–54
Hospital stay (days)	25	19.0	19	2–104
Follow-up (years)	1.8	1.8	0.3	1.3–2.2
Diagnoses ( <i>n</i> )	5.0	5.0	2.4	1–8

*Return to work status*

Forty survivors were in paid labour before injury. Thirty-five of them (87%) returned to work. Of those, 10 subjects (29%) had changed their job due to their impairments: five patients worked fewer hours than in the pre-injury situation and five patients changed to a job with less physical or mental demands. One patient (3%) retired and four patients (10%) received full disability benefits. Mean length of sick leave was 7.9 months (SD 5.5, range 1–24 months).

Of the 40 persons working before injury, 28 persons were blue collar workers and 12 persons were white collar workers. In the white collar workers, 10 patients (84%) returned to work, one patient (8%) retired and one patient (8%) received disability benefits. In the blue collar workers, 25 patients (89%) returned to work and three patients (11%) received disability benefits. No statistically significant differences in return to work or disability rates were found between blue and white collar workers.

No significant differences were found in return to work rates or length of sick leave between those patients with severe head injury (AIS head/neck-score  $\geq 4$ ) and those with mild to moderate head injury (AIS head/neck-score 1–3) or no head injury (AIS score = 0). With respect to the extremities no differences were found between patients with mild to moderate injury (AIS score 1–3) or no injuries (AIS score = 0) in this region.

When comparing severely injured patients (ISS 16–24) with those who were very severely injured (ISS  $\geq 25$ ) no significant differences were found in return to work rate, work status or length of sick leave.

*Quality of life*

The mean SIP-total score of the patients was 6.7, the mean SIP-physical score was 5.9 and the mean SIP-psychosocial score was 6.9 (see Table III). For SIP-total and SIP-psychosocial 55% of the patients could be categorized as being not disabled (SIP scores  $\leq 3$ ). Furthermore, 66% of the patients reported no disability on the physical scale of the SIP; 11% of the patients reported severe disability.

No significant differences were found in SIP scores between patients with severe head injury (AIS head/neck-score  $\geq 4$ ) and those with mild to moderate head injury (AIS head/neck-score 1–3) or no head injury (AIS score = 0). With respect to the extremities no differences were found between patients with mild to moderate injury (AIS score 1–3) or no injury (AIS score = 0) in this region.

The patients who were severely injured (ISS 16–24) did not have significant different SIP scores compared to those who were very severely injured (ISS  $\geq 25$ ).

*Predictors of disability*

From logistic regression it appeared that for SIP-total and SIP-psychosocial only age predicted disablement (odds ratio 1.07) (Table IV). This odds ratio expresses that if a patient is one year older than a patient with the same sex, injury-profile, medical history, etc., the chance of an unfavorable outcome for the older patient is 1.07 times higher than for the younger patient.

For SIP-physical none of the independent factors appeared to be significant predictors of long-term disablement.

Table II. The AIS-scores and MrAIS scores in the study group (numbers and percentages).

Body region	Median (range)	MrAIS n (%)	AIS = 0 n (%)	AIS = 1–3 n (%)	AIS = 4 n (%)	AIS = 5 n (%)
Head/neck	2.0 (0–5)	20 (38)	19 (36)	17 (32)	12 (23)	5 (9)
Face	0.0 (0–3)	0 (0)	34 (64)	19 (36)	0 (0)	0 (0)
Thorax	3.0 (0–5)	15 (28)	18 (34)	25 (47)	7 (13)	3 (6)
Abdomen	0.0 (0–4)	6 (11)	30 (57)	18 (34)	5 (9)	0 (0)
Extremities	2.0 (0–3)	12 (23)	14 (26)	39 (74)	0 (0)	0 (0)
External	0.0 (0–0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

AIS: Abbreviated Injury Scale; MrAIS: Maximum region Abbreviated Injury Scale.

Table III. SIP scores expressed in absolute values and severity groups (numbers and percentage).

	Mean, median (SD) range	No disability n (%)	Mild disability n (%)	Moderate disability n (%)	Severe disability n (%)
SIP-total	6.7, 3.0 (9.1) 0–40	29 (55)	11 (21)	7 (13)	6 (11)
SIP-physical	5.9, 1.0 (9.2) 0–39	35 (66)	8 (15)	4 (8)	6 (11)
SIP-psychosocial	6.9, 2.0 (9.9) 0–47	29 (55)	12 (23)	7 (13)	5 (9)

Table IV. Odds ratios for logistic regression using the dichotomized SIP score (no disablement [SIP scores 0–3] vs. disablement [SIP scores 4–100]) as dependent variable and age, ISS, length of hospital stay and number of diagnoses as independent variables.

	Age	ISS	Length of hospital stay	Number of diagnoses
SIP-total	1.07 ( $p=0.008$ ) $\gamma$	1.02 ( $p=0.674$ )	1.02 ( $p=0.305$ )	0.90 ( $p=0.453$ )
SIP-physical	1.04 ( $p=0.144$ )	0.99 ( $p=0.748$ )	1.02 ( $p=0.224$ )	1.21 ( $p=0.184$ )
SIP-psychosocial	1.07 ( $p=0.010$ ) $\gamma$	1.04 ( $p=0.368$ )	1.01 ( $p=0.802$ )	1.07 ( $p=0.643$ )

$\gamma = p < 0.05$ .

## Discussion

Little is known about functional outcome following severe injury. Trauma patients are generally young and as such, they have many productive life years ahead. Thus, it is of societal interest to study the return to work status and the quality of life after a severe injury. As such, these studies can be used in discussions whether the expensive trauma care cost is justified (trauma care costs in The Netherlands are approximately 952 million US dollars yearly, which is almost 5% of the total healthcare budget in The Netherlands) [15]. Therefore, we evaluated a consecutive series of severely injured patients who survived their injuries. Results presented in this study are related to those who survived; decreasing the mortality rate is of course desirable, but beyond the scope of this article.

Patients were classified as being severely injured on the basis of an AIS/ISS score greater than or equal to 16 [2–5]. We chose the ISS to classify our study population since the ISS is well known and frequently used in international literature. However, it should be kept in mind that the affected body regions and scores can lead to differences in the expected functional outcome. For example, a patient who solely sustained a severe head injury (AIS head/neck-score 4, ISS 16) may have a worse outcome than a patient with an AIS-score of 3 in both the thorax and the abdomen (ISS 18).

### Return to work

Although partly influenced by different national statutory regulations concerning worker's compensation, the return to work rate (RTW) can tell us something about the outcome of trauma patients. In our series, 87% of the patients returned to work and 10% received disability benefits. It should be kept in mind however, that these results account only for the part of the population who survived their injuries. In a country like The Netherlands, where a substantial compensation is assured, these results seem excellent. In the case of disablement, workers receive a full compensation for the first year of sick leave. For the second year 70% of the wages are paid by social security benefits.

One third of the patients had made some changes in their work attributable to their impairment. We did not find differences between blue and white collar workers, although we realize that the small number of patients might have influenced our results. Furthermore, no differences were found in RTW between severely and very severely injured patients.

Numerous studies have reported on RTW rate after trauma. MacKenzie et al. reported 72% RTW in 312 patients (aged 18–64 years) one year after a lower extremity fracture (excluding severe head injuries and spinal injuries) [16]. Of those, 8% had changed their job. White collar workers were more likely to make a successful return to work. Braithwaite et al. reported a RTW rate of 74%, five years after severe injury (mean ISS 27, mean age 37 years) [17]. Kivioja et al. studied functional outcome in severely injured patients (mean ISS 39, mean age 45 years) and found a RTW rate of 72% [18]. Whether our results are comparable, should be seen in the light of the national sick leave regulations of each country. A Dutch study concerning functional outcome six years after severe multiple injury (mean AIS/ISS 30, mean age 41 years) reported a RTW rate of 74%; 14% had changed their job in some way and 26% received disability benefits. Mean duration of sick leave was found to be 13 months [19]. Our current results seem better, probably due to the more stringently enforced social security regulations nowadays, which are known to have a positive effect on RTW [16]. However, it should be taken into account that the mean age in the formerly-mentioned studies was slightly higher than the mean age in our population, which might have biased our results. Another study, carried out more recently in The Netherlands, revealed a RTW rate of 87% in operatively treated spinal fracture patients (mean ISS 11, mean age 41 years); 13% of the patients received disability benefits [20]. These results are comparable to ours.

### Quality of life

Two years after the injury, our patients are only slightly disabled if we compare their SIP-total score to the general Dutch population (6.7 vs. 3.4) [9]. It is

not likely that further improvement will occur after this period, since it is known from literature that there is only little or no further recuperation after one year [3]. Our results seem encouraging, though it should be kept in mind that patients older than 65 years of age were excluded from our study. Additionally, results were obtained from a relatively small sample size, which makes comparison to other studies somewhat delicate.

Jurkovich et al. considered functional outcome in patients with a unilateral lower extremity fracture twelve months post-injury (mean age 35 years). Patients reported a mean SIP-total score of 6.8, 52% of the patients reported no disability and 9% of the patients reported severe disability (Table V) [12]. From this, it becomes clear that the severely injured patients from our series achieve similar results as patients with “only” a fracture of the lower extremity. Our patients also achieved comparable results to patients who sustained an unstable pelvic ring fracture (mean ISS 24, mean age 35 years). In the latter population a mean SIP-total score of 8.1 was reported [11].

In contrast, Morris et al. studied functional outcome in 61 patients 18 months after a trauma of moderate severity (mean ISS 12); a mean SIP-total score of 13.6 was found [13]. This high mean score in patients who sustained injuries of moderate severity is all the more remarkable, since patients with severe brain injury were excluded [13]. An easy explanation for this adverse outcome is not available. Possibly, the wider range in age (mean age 37 years, range 13–78 years) may have been of influence.

As mentioned before, the body regions affected can be of influence on the outcome. From literature, it becomes clear that severe injuries in the head/neck region, the spine/spinal cord and the extremities in general result in adverse outcomes [3,4,18,19,21]. The good results presented in this study might be explained by the fact that our population had a relatively low median head/neck score. Furthermore, there were no patients with severe (AIS 4–5) extremity injuries. We could not demonstrate, however, a difference between those patients with different degrees of head-injury, nor did we find a difference between those patients with no injuries in the extremities and those with moderately injured extremities. Differences in SIP scores between

severely injured patients (ISS 16–24) and very severely injured patients (ISS  $\geq 25$ ) could be demonstrated. The small sample size, however, could have been of influence.

#### *Predictors of disability*

Older age is accompanied by higher SIP scores, indicating more disablement. The ISS does not seem to be a predictor of disability looking at the results from the logistic regression analysis and considering the comparison of RTW rates and SIP scores of severely and very severely injured patients. Numerous studies have been published concerning the relationship and predictive value of injury-related parameters on functional outcome. Jurkovich et al. did not find a relation between ISS and SIP score [12]. Morris et al. did not find a relation between ISS and outcome nor between length of hospital stay and outcome. Age was a significant predictor of disability in his study, as in ours [13]. Vazquez-Mata et al. reported, similar to our results, a relation between age and outcome, and no relation between head-injury and outcome, though a weak positive correlation between ISS and outcome was found [22]. Since age is a predictor of outcome in the aforementioned studies it would be interesting to specifically study the functional outcome in elderly poly-traumatized people.

Given the good functional outcome, as well as the fact patients were young and have many productive life years ahead, optimal treatment in this category of patients seems to be worth the effort as well as the costs.

#### *Limitations*

Some limitations are present in this study. Data collection was carried out retrospectively, and the overall number of studied patients was small, which might have biased our results (although respondents did not differ from non-respondents). Those factors should be kept in mind when interpreting the results.

#### **Conclusion**

Despite the severity of their injuries, by far the majority of the severely injured patients who survive

Table V. Mean SIP scores in different categories of patients.

Authors	Category	SIP-total	SIP-physical	SIP-psychosocial
Present study	Trauma: Severe injuries (mean ISS 23.5)	6.7	5.9	6.9
Jurkovich et al. [12]	Trauma: Unilateral lower extremity fractures	6.8	5.5	5.5
Morris et al. [13]	Trauma: Moderate severe injuries (mean ISS 12)	13.6	11.6	9.5
Gruen et al. [11]	Trauma: Unstable pelvic ring fracture	8.1	6.8	7.4

their injuries succeed in returning to their former work. Furthermore, 1–2 years post-injury, the patients' quality of life seems to be fine compared to the general population and compared to trauma patients with lower injury severity rates. Only age appears to be a predictor of long-term disablement, whereas a relation between injury severity and outcome could not be demonstrated. Severity of brain injury does not seem to be of influence on outcome, although our sample size may have been of influence on this result. Given the good results in the survivors, optimal treatment in this category of patients seems to be worth the effort as well as costs. Further research in this field should be done however in a larger study population.

## References

- Mock C, MacKenzie E, Jurkovich G, Burgess A, Cushing B, deLateur B, McAndrew M, Morris J, Swiontkowski M. Determinants of disability after lower extremity fracture. *J Trauma* 2000;49:1002–1011.
- Young WW, Young JC, Smith JS, Rhodes M. Defining the major trauma patient and trauma severity. *J Trauma* 1991;31:1125–1141.
- Sluis CK van der, ten Duis HJ, Geertzen JH. Multiple injuries: An overview of the outcome. *J Trauma* 1995;38:681–686.
- Anke AG, Stanghelle JK, Finset A, Roaldsen KS, Pillgram-Larsen J, Fugl-Meyer AR. Long-term prevalence of impairments and disabilities after multiple trauma. *J Trauma* 1997;42:54–61.
- Rhodes M, Aronson J, Moerkirk G, Petrash E. Quality of life after the trauma center. *J Trauma* 1988;28:931–937.
- American Association for the Advancement of Automotive Medicine. The abbreviated injury scale, 1990 revision. des Plaines, Illinois; 1990.
- Kingma J, ten Vergert E, Werkman H. A Turbo Pascal program to convert ICD-9CM coded injury diagnoses into injury severity scores: ICDTOAIS. *Percept Mot Skills* 1994;78:915–936.
- Baker SP, O'Neill B, Haddon WJ, Long WB. The injury severity score: A method for describing patients with multiple injuries and evaluating emergency care. *J Trauma* 1974;14:187–196.
- Jacobs HM, Luttik A, Touw-Otten FW, de Melker RA. De 'sickness impact profile'; resultaten van een valideringsonderzoek van de Nederlandse versie. [The sickness impact profile; results of an evaluation study of the Dutch version]. *Ned Tijdschr Geneesk* 1990;134:1950–1954.
- Bergner M, Bobbitt RA, Carter WB, Gilson BS. The Sickness Impact Profile: Development and final revision of a health status measure. *Med Care* 1981;19:787–805.
- Gruen GS, Leit ME, Gruen RJ, Garisson HG, Auble TE, Peitzman AB. Functional outcome of patients with unstable pelvic ring fractures stabilized with open reduction and internal fixation. *J Trauma* 1995;39:838–844.
- Jurkovich G, Mock C, MacKenzie E, Burgess A, Cushing B, deLateur B, McAndrew M, Morris J, Swiontkowski M. The Sickness Impact Profile as a tool to evaluate functional outcome in trauma patients. *J Trauma* 1995;39:625–631.
- Morris S, Lenihan B, Duddy L, O'Sullivan M. Outcome after musculoskeletal trauma treated in a regional hospital. *J Trauma* 2000;49:461–469.
- Gilson BS, Gilson JS, Bergner M, Bobbit RA, Kressel S, Pollard WE, Vesselago M. The sickness impact profile. Development of an outcome measure of health care. *Am J Public Health* 1975;65:1304–1310.
- Beeck EF van, van Roijen L, Mackenbach JP. Medical costs and economic production losses due to injuries in the Netherlands. *J Trauma* 1997;42:1116–1123.
- MacKenzie EJ, Morris J-AJ, Jurkovich GJ, Yasui Y, Cushing BM, Burgess AR, deLateur BJ, McAndrew MP, Swiontkowski MF. Return to work following injury: The role of economic, social, and job-related factors. *Am J Public Health* 1998;88:1630–1637.
- Braithwaite IJ, Boot DA, Patterson M, Robinson A. Disability after severe injury: Five-year follow-up of a large cohort. *Injury* 1998;29:55–59.
- Kivioja AH, Myllynen PJ, Rokkanen PU. Is the treatment of the most severe multiply injured patients worth the effort? A follow-up examination 5 to 20 years after severe multiple injury. *J Trauma* 1990;30:480–483.
- Sluis CK van der, Eisma WH, Groothoff JW, ten Duis HJ. Long-term physical, psychological and social consequences of severe injuries. *Injury* 1998;29:281–285.
- Leferink VJM, Keizer HJE, Oosterhuis JK, Sluis CK van der, ten Duis HJ. Functional outcome in patients with thoracolumbar burst fractures treated with dorsal instrumentation and transpedicular cancellous bone grafting. *Eur Spine J* 2003;12:261–267.
- MacKenzie EJ, Shapiro S, Smith RT, Siegel JH, Moody M, Pitt A. Factors influencing return to work following hospitalization for traumatic injury. *Am J Public Health* 1987;77:329–334.
- Vazquez-Mata G, Rivera-Fernandez R, Perez-Aragon A, Gonzalez-Carmona A, Fernandez-Mondejar E, Navarrete-Navarro P. Analysis of quality of life in polytraumatized patients two years after discharge from an intensive care unit. *J Trauma* 1996;41:326–332.